Year 2004 Progress Report of Activities

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The Kika de la Garza Plant Materials Center (PMC) is a 91-acre facility established to provide cost-effective vegetative solutions for soil and water conservation problems. This means identifying plants and developing techniques for successful conservation use. It also means assisting in the commercial development of these plants and promoting their use in natural resource conservation and other environmental programs.

The PMC was established in 1981. It is one of 26 centers located throughout the United States. The PMC is operated by the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), in cooperation with an Advisory Board from Texas A&M University-Kingsville, the Caesar Kleberg Wildlife Research Institute (CKWRI), South Texas Association of Soil & Water Conservation Districts, and the Gulf Coast Association of Soil & Water Conservation Districts. The Kika de la Garza PMC serves approximately 27 million acres of the southern portion of Texas.

Program Emphasis

The mission of the Kika de la Garza PMC is to develop and transfer plant science technology to solve natural resource problems in the South Texas area. Plant testing and plant selection as well as the development of new plant science technologies are the primary products of our program. The PMC conducts plantings and studies at the Center and off-Center with cooperating partners. The PMC works with NRCS Field Offices and Resource Conservation and Development (RC&D) groups, Conservation Districts, federal and state agencies, and private landowners.

Our current program emphasis at the PMC is in the following areas:

- Rangeland Habitat Restoration and Enhancement
- Coastal Shoreline Stabilization
- Coastal Habitat Restoration and Enhancement
- Erosion Control/Water Quality Improvement on Agricultural Land

Following are highlights of some of the activities of the PMC for 2004. Please contact the PMC for more detailed information.

Rangeland Habitat Restoration and Enhancement

South Texas Natives Project:

The goal of the South Texas Natives Project (STN) is to provide economically viable sources of plants and seeds and to develop effective planting strategies for the restoration of South Texas plant communities. As a partner in this initiative, the Kika de la Garza Plant Materials Center is establishing a nursery of South Texas ecotypes of a variety of grasses, forbs, and legumes. Ecotypes will be developed for 3 basic regions: the Gulf Coast Prairie, the South Texas Plain and the Coastal Sand Plain. The ecotype regions were established to be large enough to support a commercial seed market, but small enough to retain regional integrity and genetic adaptability. The nurseries consist of approximately 20 collections of each species per ecoregion. Transplants are established in isolated areas as necessary to maintain species integrity and diversity. The nurseries are hand harvested to ensure a complete spectrum of seed is harvested from each species. Ecotypic seed will then be planted in production fields where it will be harvested and bulked per species for each ecoregion. The ecoregion seed will then be made available to commercial seed growers.


Bordered Patch Butterfly


Awnless Bush-sunflower

In 2004, we received 219 collections from the STN Project representing 47 species. This included 152 collections representing 47 species for the South Texas Plain Ecoregion, 66 collections representing 30 species for the Coastal Sand Plain Ecoregion, and 1 collection representing 1 species for the Gulf Coast Prairie Ecoregion.

Since 2001, we have received 1,555 collections for the South Texas Plain Ecoregion and 216 collections representing the Coastal Sand Plain Ecoregion. The nursery was expanded to 397 accessions in 2004, representing 31 species.

In December 2004, we seeded trays to add to the seed nursery. This included 338 collections representing 26 species for the South Texas Plain and Coastal Sand Plain Ecoregions, and 30 collections representing 7 species for the Gulf Coast Prairie Ecoregion. These seedlings will be planted both on and off-site for evaluation and seed production.

The Gulf Coast Ecotype Project:


Florida Paspalum

In 2001, an initiative was begun between the USFW Service, CKWRI, the Gulf Coast Association of Soil and Water Conservation Districts, the STN Project, and the Kika de la Garza PMC to produce native, eco-typic plant material to displace invasive species on pastures and agricultural fields, along the Texas Gulf Coast. Thirteen species including 4 forbs, 1 cool season grass, and 8 warm season grasses were selected for initial collecting and evaluation. Ten to twenty-five collections of each species are being made by the partners of this project, as well as a few other groups, from the 30 counties along the Texas Gulf Coast.

A nursery has been established at the PMC. Transplants are planted in irrigated field plots where seed is hand harvested and evaluated for production, germination, and establishment. Successful collections will eventually be released for commercial production.

Since 2001, 93 collections have been received, representing all thirteen species. The field nursery now consists of 52 accessions representing 11 of the 13 species. In 2004, 3 new collections were received. In December 2003, 2 of these collections were seeded in the greenhouse. Those exhibiting good germination will be transplanted into the field beginning in the spring.

Windmillgrass


Filiberto in a Shortspike Windmillgrass Plot

Hooded windmillgrass (*Chloris cucullata*) and shortspike windmillgrass (*Chloris subdolichostachya*) are warm-season perennial grasses that are native throughout Texas. These two species appear to have the characteristics necessary for planting on highly erodible sites and on sites where invasive species are a problem. Hooded windmillgrass is a short (15-60 cm) perennial bunchgrass that has a high pure live seed (pls) count of around 90% with rapid germination, typically within the first 3 days. It produces multiple seed crops, allowing it to reseed itself and spread. Shortspike windmillgrass is a medium growth (30-90 cm) stoloniferous perennial that has good germination (60%) while also having some dormant seed (30%) to protect it during droughty conditions. The stoloniferous nature allows it to vegetatively spread quickly to provide soil coverage.

Filiberto Herrera, a graduate student at Texas A&M University-Kingsville, has been evaluating windmillgrass at the PMC for the last two years. Over 43 original collections from across Texas were initially planted and evaluated at the PMC. In 2002, selected accessions (301, 300, 313 and 316 of hooded windmillgrass and 260, 262, 283, 289 of shortspike windmillgrass) were sent to the Beeville Agricultural Experiment Station for evaluation. Shortspike windmillgrass accessions 260 (San Patricio) and 283 (Calhoun) and hooded windmillgrass accessions 313 (Kenedy) and 301 (Duval) have stood-out as the top performing collections at both locations. The shortspike collections have ranged in active germination from 58-72% with 15-30% dormant seed and the hooded windmillgrass has had active germination rates of 70-93%.

A field planting study was initiated on May 28, 2004 to compare seedling establishment and cover of three windmillgrass accessions (260, 283, and 313). Field plots were 10'x20'. Plots were seeded at a rate of 20 pls/ ft^2 and replicated three times. An evaluation of these plots on November 23, 2004 showed establishment cover of 22% for 313, 45% for 283, and 60% for 260.

Because of promising initial research, further research into establishment and coverage will be done on a variety of soil types and locations in Texas. Future research at the PMC will focus on management practices that may control seed dormancy and seed fill.

Native Plant Restoration & Diversity Methods


Bomer Field Plots


Control vs. Sprayed

Buffelgrass (*Pennisetum ciliare* (L.) Link) is a warm-season grass that has been introduced to South Texas from Africa. Buffelgrass is highly competitive in warm, dry environments and is resistant to heavy grazing and frequent fires. As a result, many areas in South Texas support stands of buffelgrass. However, monocultural stands of buffelgrass have been shown to support less diversity and abundances of native birds.

Aaron Tjelmeland, a graduate student at TAMUK, and the PMC are attempting to diversify dense stands of buffelgrass by interseeding native forbs and legumes. Three experiments at the Bomer Wildlife Management Area focus on using different herbicide regimes to establish native plants. One experiment will use Imazapyr in an attempt to establish native grasses or native legumes, another experiment will use glyphosate and clethodim to establish native forbs, and a third will use glyphosate or Imazapic and fluazifop-P-butyl or clethodim to establish native legumes.

At the El Panal Ranch in Starr County another experiment is being conducted to determine the effect that diversifying buffelgrass will have on bobwhite quail (*Colinus virginianus*). For this experiment, we are interseeding BeeWild bundleflower (*Desmanthus bicornutus*) into a monoculture buffelgrass stand. We mowed and sprayed glyphosate to clear strips in the buffelgrass and then planted into those strips. Clethodim, a grass selective herbicide, is being applied when buffelgrass begins to grow back so that the bundleflower has time to establish. Bobwhites have been collared with radio transmitters and will continue to be monitored so that their movements may be observed as the bundleflower is establishing.

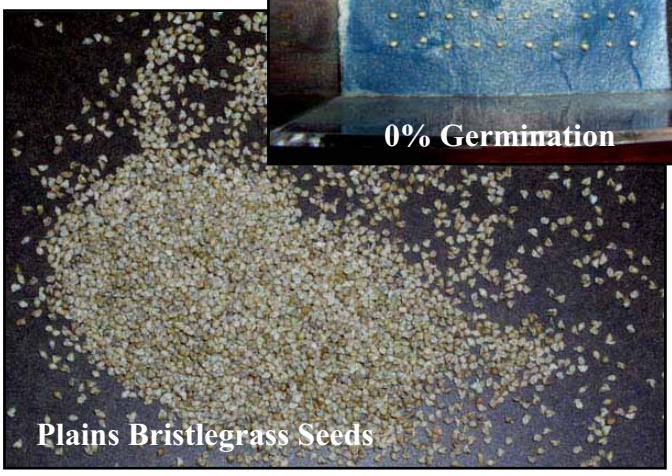
Plains Bristlegrass Germination Trials

At first glance bristlegrass seems to be an ideal species to work with. A perennial, native forage species, it produces a nice round, hard seed that flows easily in equipment. But then one is forced to look closer. First, there is a little understood hybridization complex within the genus, so it is often difficult to determine just which species of bristlegrass (*Seteria* spp.) we are dealing with. The inflorescence is indeterminate, so even though it produces multiple harvests per year, we can never get a fully mature harvest. Then add the problem of poor seed fill. This could be a result of climate, chromosome separation, or both. Since the seed produced is hard, it is difficult to separate filled seed from unfilled seed. Unfortunately our most accurate method so far is testing each individual seed with a pair of tweezers.

Then there are the germination tests. Our hope is to find a collection that has high early germination for quick establishment. Some seed dormancy (up to 30%) in the seed is also useful, in the event conditions after seeding turn unfavorable. The germination results we have gotten over the past three years ranges from 0-4% with an occasional 10-13%. Commercial lab, as well as in house, tests have shown often a large percentage of the seed is viable, but dormant.

In the event the dormancy was mechanical, caused by the hardness of the seed coat, we tried several methods to soften or remove some of the coat.


0% Germination


Plains Bristlegrass Seeds

We have tried varying times in a sandpaper drum to wear down the seed coat (0% germination), varying times and strengths of sulfuric acid to burn holes in the seed coat (0-9%), and submersion of seeds in boiling water (0%).

In the event the dormancy was chemical, caused by a chemical(s) that needed to breakdown or leach out, we tried several methods to overcome this type of dormancy. We have tried cold or room temperature storage (0-8%), no storage or storage for a year (0%), hanging seeds under dripping water (0%), using bristlegrass leachate or seeds in trays to germinate other seeds (no decrease in germination of lettuce seeds), aerating seeds in a fresh water bath (0-2%), warmer or cooler than standard germination temperatures (0%), and treating seed with various chemicals know to effect germination in other species: hydrogen peroxide, bleach, dioxane, acetone, potassium nitrate, and gibberilic acid.

We have also tried varying harvesting styles (0-8%), light or no light regimes (0-8%), switching of temperatures to represent seasonal change, seeding trays of soil in the greenhouse (0-13%), and fungicide treatments to control fungi during germination.

So far NO treatment has allowed us to bring the germination of any collection over 15%. Seed and a list of experiments we have tried was sent to a commercial seed testing lab in 2004 in hopes that they have some trick we have not tried yet. So far they have not had any luck either. We will keep looking…

Seed Coating


Arizona Cottontop Seedhead

Many of the Native grasses found in South Texas have hairs and appendages that make them difficult to plant and harvest. These physical characteristics make the seed stick together such that they tend to look like a birds nest. This intertwining nature makes the seed ride high in the seed hopper, making it difficult to plant and maintain a consistent seeding rate.

Coating the seed has the potential to moderate this problem and possibly enhance seed germination and field establishment. When the seed is coated, it changes a fluffy, hairy seed to a smooth seed that can easily flow through a drill. Furthermore, treatments can add coatings of fertilizer, mycorhizae, moisture absorbing polymers, and seed safeners to protect and enhance field establishment.


Non-coated and Coated Arizona Cottontop Seed

A field seeding of Arizona cottontop was planted at the PMC on May 28, 2004. The plots were 10'x20' and consisted of three treatments each replicated three times. The treatments were: 1) an uncoated Arizona cottontop selection from Knox City, Texas, 2) an uncoated Arizona cottontop composite from South Texas, grown at Bladerunner Farms, Poteet, Texas, and 3) a dolomite clay coated Arizona cottontop composite from South Texas, grown at Bladerunner Farms, Poteet, Texas. Seeding rates were 20 pls/ ft^2. An evaluation of the plots on November 23, 2004 showed establishment cover of 15% for the Knox City source, 43% for the uncoated South Texas composite, and 47% for the coated South Texas composite.

A germination chamber evaluation of these three seed lots was done. It was replicated three times at 50 seeds each. A higher germination rate was found for 2003 South Texas composite grown at Bladerunner Farms (a germination rate of 58% coated and 65% uncoated). The 1999 harvest of Arizona cottontop from Knox City had a germination rate of 32%.The lower rate of germination for the Knox City collection might be due to the age of the seed compared to the Bladerunner seed (2003). All seed lots showed good early germination characteristics with germination rates of 25-50% by day 3 or 4.

The results from our study indicate that seed coating has excellent potential to improve the seed handling of the many fluffy, hairy, bristly grasses of South Texas with out decreasing their germination and seedling establishment. Furthermore, the South Texas composite revealed higher rates of germination and field establishment than the North Texas source from the Knox City PMC.